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We Claim:

1. A positioning system orienting an object in a wind tunnel, comprising: 4658635 *

a cylindrical sleeve having a longitudinal axis that defines a system axis; 4522074

a first motor assembly mounted rearward of the sleeve, along the system axis, and configured to rotate the sleeve about the system axis;

a torque tube mounted to the sleeve such that the longitudinal axis of the tube is askew at a prescribed angle with respect to the system axis, such that rotation of the sleeve causes the torque tube to rotate about the system axis, and such that the tube is rotatable about the tube's longitudinal axis;

a second motor assembly mounted rearward of the sleeve, along the system axis, and configured to rotate the torque tube about the tube's longitudinal axis;

an elongated, crooked shaft having an axis of rotation, the shaft attached to the torque tube such that rotation of the torque tube about the tube's longitudinal axis causes the shaft to rotate about the shaft's axis of rotation, the shaft having a first end spaced from the torque tube and askew at a prescribed angle with respect to the shaft's axis of rotation; and

a sting assembly configured to receive an object, the sting assembly rotatably attached to the first end of the shaft, the sting assembly having a third motor assembly configured to rotate the sting assembly about the sting's longitudinal axis;

wherein rotation of the sleeve, the shaft and the sting about their corresponding axes combine to provide roll, pitch and yaw positioning of the object.

2. A positioning system as defined in claim 1, wherein the torque tube extends axially from rotational attachments spaced apart from one another within the sleeve.

3. A positioning system as defined in claim 1, wherein the first and second motor assemblies each include a harmonic drive.

4. A positioning system as defined in claim 3, wherein the harmonic drives each have a gear reduction in a range from 50:1 to 160:1.

5. A positioning system as defined in claim 1, wherein the positioning system is configured to dynamically provide a change in pitch and yaw.

6. A positioning system as defined in claim 5, wherein the positioning system is configured to dynamically provide a change in pitch of the object at a rate up to about 1.5 degrees/second and a change in yaw at a rate up to about 1.5 degrees/second at a resolution of 0.01 degrees, wherein further the positioning system is configured to provide a resolution in pitch of about 0.02 degrees and a resolution in yaw of about 0.01 degrees.

7. A positioning system as defined in claim 1, further comprising a computer system configured to actuate the first, second and third motor assemblies.

8. A positioning system as defined in claim 7, wherein the computer system is configured to receive and execute a testing profile for movement of the object sequentially through a range of orientations.

9. A positioning system as defined in claim 1, further comprising:

a housing enclosing the cylindrical sleeve;

sway rails configured to be fixed relative to a wind tunnel;

a carriage slidably attached to the sway rails to provide horizontal displacement; and

a heave strut attached to the housing and slidably mounted to the carriage to provide vertical displacement.

10. A positioning system as defined in claim 9, further comprising a fourth motor assembly configured to slide the carriage along the sway rails and a fifth motor assembly configured to slide the heave strut relative to the carriage.

11. A positioning system as defined in claim 10, further comprising a computer system configured to actuate the first, second, third, fourth and fifth motor assemblies.

12. A positioning system as defined in claim 11, wherein the computer system is configured to receive and execute a testing profile for movement of the object sequentially through a range of orientations.

13. A method of positioning an object in a wind tunnel, comprising:

mounting a first object to a positioning system, the positioning system including

a cylindrical sleeve having a longitudinal axis that defines a system axis;

a first motor assembly mounted rearward of the sleeve, along the system axis, and configured to rotate the sleeve about the system axis,

a torque tube mounted to the sleeve such that the longitudinal axis of the tube is askew at a prescribed angle with respect to the system axis, such that rotation of the sleeve causes the torque tube to rotate about the system axis, and such that the tube is rotatable about the tube's longitudinal axis,

a second motor assembly mounted rearward of the sleeve, along the system axis, and configured to rotate the torque tube about the tube's longitudinal axis,

an elongated, crooked shaft having an axis of rotation, the shaft attached to the torque tube such that rotation of the torque tube about the tube's longitudinal axis causes the shaft to rotate about the shaft's axis of rotation, the shaft having a first end spaced from the torque tube and askew at a prescribed angle with respect to the shaft's axis of rotation, and

a sting assembly configured to receive the first object, the sting assembly rotatably attached to the first end of the shaft, the sting assembly having a third

motor configured to rotate the sting assembly about the sting's longitudinal axis; and

providing the first object a prescribed orientation within a wind tunnel based upon rotation of the sleeve, the shaft, and the sting about their corresponding axes.

14. A method as defined in claim 13, wherein a second object is located in the wind tunnel and the first object positioned relative thereto.

15. A method as defined in claim 13, wherein the positioning system further includes a computer system configured to actuate the first, second and third motor assemblies.

16. A method as defined in claim 15, further comprising executing a testing profile provided to the computer system in which the object is dynamically provided a plurality of orientations.

17. A method as defined in claim 16, wherein a second object is located in the wind tunnel and the first object dynamically positioned relative thereto.

18. A method as defined in claim 13, wherein the positioning system further includes

a housing enclosing the cylindrical sleeve;

sway rails configured to be fixed relative to a wind tunnel;

a carriage slidably attached to the sway rails to provide horizontal displacement; and

a heave strut attached to the housing and slidably mounted to the carriage to provide vertical displacement.

19. A method as defined in claim 18, wherein the positioning system further includes a fourth motor assembly configured to slide the carriage along the sway rails and a fifth motor assembly configured to slide the heave strut relative to the carriage.

20. A method as defined in claim 19, wherein the positioning system further includes a computer system configured to actuate the first, second, third, fourth and fifth motor assemblies.

21. A method as defined in claim 20, further comprising executing a testing profile provided to the computer system in which the object is dynamically provided a plurality of orientations.

22. A method as defined in claim 21, wherein a second object is located in the wind tunnel and the first object dynamically positioned relative thereto.